

**IN THE  
UNITED STATES PATENT & TRADEMARK OFFICE**

APPLICATION NO:               **10/520,652**  
APPLICANT:                   **MATSUTERA, Hisao**  
FILING DATE:               **7 January 2005**  
TITLE:                       **MAGNETIC RANDOM ACCESS MEMORY**  
CONFIRMATION NO.           **5187**

TECH CENTER/ART UNIT:   **2818**  
EXAMINER:                  **TAYLOR, Earl N.**

DOCKET NO.:                **204766-9001**

COMMISSIONER FOR PATENTS  
P.O. BOX 1450  
ALEXANDRIA, VA 22313-1450

**AMENDMENT**

Dear Sir:

In response to the Office Action dated March 6, 2006, please amend the above-identified application as follows:

**Amendments to the Claims** are reflected in the listing of claims which begins on page 2 of this paper.

**Remarks/Arguments** begin on page 6 of this paper.

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

1-5. (Cancelled)

6. (Currently amended) A magnetic random access memory comprising a plurality of memory cells, each of which comprises:

a free layer which has a reversible free spontaneous magnetization;

a synthetic ferrimagnetic fixed layer; and

a spacer layer formed of non-magnetic material and interposed between said free layer and said synthetic ferrimagnetic fixed layer,

wherein said synthetic ferrimagnetic fixed layer comprises:

a first pinned layer which has a first fixed spontaneous magnetization fixed in a first direction; and

a second pinned layer which has a second fixed spontaneous magnetization fixed in a second direction which is opposite to said first direction,

said first pinned layer comprises:

a first portion provided to extend said first direction; and

a second portion formed on said first portion such that said second portion is aligned in position with said second pinned layer in a direction perpendicular to a surface of a substrate on which said magnetic random access memory is formed,

said first pinned layer and said second pinned layer are formed such that said synthetic ferrimagnetic fixed layer does not substantially influence on said free layer due to orange peel effect,

when said first fixed spontaneous magnetization is  $M_1$  said second fixed spontaneous magnetization is  $M_2$  and said second ~~portion~~ pinned layer has a thickness of  $t_2$ , said second portion is formed to have a thickness of  $(M_2/M_1)*t_2$ , and

said synthetic ferrimagnetic fixed layer is formed such that said synthetic ferrimagnetic fixed layer does not substantially give influence of the magneto-static coupling effect to said free layer.

7-9. (Cancelled)

10. (Previously presented ) A magnetic random access memory comprising a plurality of memory cells, each of which comprises:

a free layer which has reversible free spontaneous magnetization;

a synthetic ferrimagnetic fixed layer; and

a spacer layer of non-magnetic material interposed between said free layer and said synthetic ferrimagnetic fixed layer,

wherein said synthetic ferrimagnetic fixed layer comprises:

a first pinned layer which has first fixed spontaneous magnetization in said first direction;

and

a second pinned layer provided between said free layer and said first pinned layer to have second fixed spontaneous magnetization in said second direction which is opposite to said first direction,

said first pinned layer comprises:

a first portion provided to extend in said first direction and said second direction; and

a second portion formed on said first portion such that said second portion is aligned in position with said second pinned layer in a direction perpendicular to a surface of a substrate on which said magnetic random access memory is formed, and

when said first fixed spontaneous magnetization is  $M_1$ , said second fixed spontaneous magnetization is  $M_2$  and a thickness of said second pinned layer is  $t_2$ , said second portion has a thickness substantially equal to  $(M_2/M_1)*t_2$ .

11. (Cancelled)

12. (Previously presented ) A magnetic random access memory comprising a plurality of memory cells, each of which comprises:

a free layer which has reversible free spontaneous magnetization;

a synthetic ferrimagnetic fixed layer; and

a spacer layer of non-magnetic material interposed between said free layer and said synthetic ferrimagnetic fixed layer,

wherein said synthetic ferrimagnetic fixed layer comprises:

a first pinned layer which has first fixed spontaneous magnetization in a first direction;

and

a second pinned layer provided between said spacer layer and said first pinned layer to have a second fixed spontaneous magnetization fixed in a second direction which is opposite to said first direction, and

said first fixed spontaneous magnetization  $M_1$ , said second fixed spontaneous magnetization  $M_2$ , a film thickness  $t_1$  of said first pinned layer and a film thickness  $t_2$  of said second pinned layer are determined to satisfy the following equation:

$$\frac{M_1}{M_2} \bullet \frac{t_1}{t_2} > 1$$

13. (Original) The magnetic random access memory according to claim 12, wherein said  $M_1$  and said  $M_2$  are substantively equal to each other.

14. (Original) The magnetic random access memory according to claim 12, wherein said first pinned layer and said second pinned layer are formed of same material.

15. (Original) The magnetic random access memory according to claim 12, wherein the following equation:

$$M_1 > M_2$$

is satisfied.

16. (Cancelled)

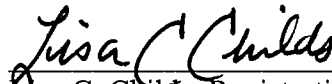
Application No.: 10/520,652  
Amendment Dated: May 26, 2006  
Reply to Office Action Dated: March 6, 2006

**REMARKS/ARGUMENTS**

Applicant has canceled claims 1-5, 7-9, 11 and 16, leaving claims 6, 10, and 12-15 in the case. Applicant has amended claim 6 in accordance with the Examiner's suggestion. Because the Examiner has indicated that claims 6, 10, and 12-15 are allowable, Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Date: May 26, 2006

Respectfully submitted,



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